

Optimization of magnetic properties of $\text{Hf}_2\text{Co}_{11}\text{B}$ alloys by high pressure torsion or annealing

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Modifications of microstructure play an important role in ongoing investigation of the new permanent magnet materials. Depending on the particular system and conditions, high pressure torsion (HPT) [1] can lead to amorphization, comminution of grains or to crystallization. Heat treatment and plastic deformation were used to modify the crystalline structure and investigate its influence on the magnetic properties of $\text{Hf}_2\text{Co}_{11}\text{B}$ ribbons. X-ray diffraction (XRD) and differential scanning calorimetry (DSC) confirmed that plastic deformation of partially crystalline alloy led to its amorphization. The coercive field H_c of the annealed sample after HPT was reduced from 0.7 to 0.2 kOe, while the subsequent reannealing of the deformed sample enhanced H_c up to 1.3 kOe. The coercivity value was doubled, thus revealing that the existing nuclei of the hard magnetic phase facilitates its further growth.

References:

[1] B. Straumal, A. Korneva, P. Zieba, Arch. Civ. Mech. Eng. 14 (2014) 242–249